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The skin temperature under multilayered bandages during exercise

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ABSTRACT

Background: MultiLayer Bandages (MLB) assume a prominent role in the physical treatment of lymphedema, being an integral part of decongestant lymphatic therapy. This, according to the International Society of Lymphology, consists of a reduction phase and a maintenance phase and includes procedures such as: hygiene care, manual lymphatic drainage, multilayered bandages, exercise, and elastic compression [1]. Although MLBs are widely used in the treatment of lymphedema, and the physical principles underlying their therapeutic efficacy are well known [2], the mechanism of action regarding the thermal effect has not been clearly defined. When applied, they cause an rise in skin temperature [3], and during exercise this temperature further increases due to the intensification in metabolic activity and heat production [4,5], but there is no actual data regarding the temperature values and its variation (3). The aim of this study was to evaluate the cutaneous temperature of the upper limb when submitted to the application of MLB during physical exercise of moderate intensity [4], and clarify if the temperature is an obstacle to its use, when compared to the upper limb skin reference value.

Methods: A quasi-experimental study was designed with a sample of 30 individuals (without known pathology). All participants signed an informed consent and the study followed all the principles of the Declaration of Helsinki. The individuals were submitted to the application of a temperature-bioPLUX research sensor in the external region of both forearms. The experimental group (EG) was considered to be the dominant upper limb submitted to MLB application and the control group the contralateral upper limb. The temperature was recorded in 4 evaluation moments: at rest, before and after MLB application, during exercise on an elliptical trainer (until the individual reached 69% of the Maximum Heart Rate) and after cessation of exercise (when the rest Heart Rate was reached). Descriptive statistics were used to characterise the sample, using inferential statistics to analyse the research questions. The results were considered significant at the significance level of 5% and the statistical program SPSS v23.0 was used.

Results: At the first evaluation moment of at rest and without band, no statistically significant differences between the groups were detected. The experimental group had $32.8 \pm 0.85^{\circ}C$ and the control group $32.7 \pm 0.81^{\circ}C$ ($p = .088$). With MLB application at rest (second evaluation moment) and during exercise (third evaluation moment), there was a statistically significant difference between the groups ($p < .001$). At the last evaluation moment (post-exercise) the temperature of the experimental group continued to increase to $35.0 \pm 0.67^{\circ}C$, whereas the control group decreased to $32.8 \pm 0.90^{\circ}C$, and a statistically significant difference was observed ($p < .001$). Despite the increase observed in the EG, the value did not exceed the skin reference value of the upper limb [4,6].

Discussion and Conclusions: The results obtained allow us to conclude that with the application of MLB the skin temperature raises, which agrees with the results of Belgrado [3], who states that the increase in the skin temperature under MLB occurs minutes after its application. With exercise, it is observed that the skin temperature continues to rise justified by the intensification in metabolic activity, being necessary to activate the hypothalamic thermoregulation system [7]. When physical exercise ceases, the cutaneous temperature of the upper limb with MLB continues to rise due to the inability to release heat. Lim [6] and Campbel [8] state that if heat dissipation is not carried out effectively, heat builds up and increases body temperature. Despite this increase in temperature, the maximum values collected during the study did not exceed the skin reference temperature of the upper limb for individuals without pathology (35.5°C) defined in the literature [6,9]. Therefore, the temperature was not considered as an obstacle in the use of MLB for the population in study.

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References

[1] International Society of Lymphology. The diagnosis and treatment of peripheral lymphedema: 2016 consensus document of the International Society of Lymphology. Acta Angiol. 2017;49:170–184.

[2] Hara H, Hamanaka N, Yoshida M, et al. Variability in compression pressure of multi-layer bandaging applied by lymphedema therapists. Support Care Cancer. 2019;27(3):959–963.

[3] Belgrado J-P, Moraine J-J. The skin temperature under multilayered bandages. Eur J Lymphology. 2006;16(47):17–20.

[4] Magal M, Riebe D, Ehrman JG. CSM's guidelines for exercise testing and prescription. 10th ed. Philadelphia: Kluwer Wolters; 2018.

[5] Etain AJ. Recent advances in thermoregulation. Adv Physiol Educ. 2015;39(3):139–148.
[6] Lim C, Lee JB. Human thermoregulation and measurement of body temperature in exercise and clinical settings. Artic Ann Acad Med. 2008;37(4):347–353.
[7] Crandall CG, Wilson TE, Kregel KC. Mechanisms and modulators of temperature regulation. J Appl Physiol. 2010;109(4): 1219–1220.
[8] Campbel I. Body temperature and its regulation. Anesth Intensive Care. 2011;12:240–244.
[9] Martins J. Mecanismos físicos de perda de calor e factores associados relacionados ao exercício. R Educ Fís. 1998;6(2): 5–20.

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Sports injuries patterns in children and adolescents according to their level of sports participation, age and maturation

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ABSTRACT

Introduction: Engaging in sports activities at a young age has numerous health benefits but also involves risk of injury. Growth can make young athletes more vulnerable to sports injuries [1]. Few studies have produced information about injury profile and its predictors at these ages. The aim of this study is to determine the influence of age, maturation and physical activity (PA) level on injury type and body area injury location on a Portuguese sample.

Methods: A descriptive epidemiological study was conducted. Injury profile and PA level information's were obtained by LESADO and RAPIL II questionnaires. These data allowed to create four groups of PA levels. The no sports participation group, with no time spent in PA per week (except mandatory physical education classes), the recreative sports group with at least 90 min of PA per week being at least 60% of this volume of recreational activity; the school sports group with at least 90 min of PA per week being at least 60% of this volume of school sports activity and the federated sports group with at least 120 min of federated activity. Maturity measures were evaluated through maturity offset and Tanner-Whitehouse III method. Univariate analysis was used to identify the set of candidate predictors for multinomial logistic regression analysis that was used to determine significant predictors of injury type and body area injury location. Ethics Committee of the Faculty of Human Kinetics approved the research protocol. Before inclusion in the study all subjects' parents gave their written informed consent.

Results: A total of 651 adolescents participated in this study, aged between 10 and 18 years (Mean = 13.7 years; Standard Deviation =1.8 years), being 343 boys (52.7%) and 308 girls (47.3%). Regarding injury type predictors recreative boys had more chances of having a sprain or a fracture than a strain when compared to federated boys ($\chi^2(4)=15.165$, $p=.004$). Also, recreative and scholar girls had more chances of having a sprain than a strain when compared to federated girls ($\chi^2(6)=16.474$, $p=.011$). As maturity offset decreased, the chances of girls having a strain or a fracture when compared to sprains were higher ($\chi^2(2)=15.115$, $p=.001$). For body area location boys with 10–11 years were more likely to have upper limbs injuries than boys of other ages ($\chi^2(6)=13.587$, $p=.033$). This was also confirmed by maturity offset ($\chi^2(2)=6.014$, $p=.049$). Spine and trunk injuries were more likely to occur in federate and no sports participation girls ($\chi^2(6)=14.587$, $p=.022$).

Discussion and conclusions: Each sport group presented a specific injury profile and Peak Height Velocity was a significant predictor of injury patterns in adolescents of both sexes. The combination of growth, sport training and competition, create situations conducive to the development of specific injuries [2]. At these ages chronological age may be an incomplete indicator for injury risk, as some authors are starting to recognise [2,3]. It seems warranted that the influence of maturity status and PA level on sports injuries should be studied in future studies.

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